

PATENT SPECIFICATION

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(19)



(54) A FILTER

(71) We, PUROLATOR FILTER G.m.b.H.,
of 45 Schleifbachweg, D-711 Oehringen,
Germany, a German body corporate, do
hereby declare the invention, for which we
pray that a patent may be granted to us, and
the method by which it is to be performed,
to be particularly described in and by the
following statement:

The invention relates to a filter, more par-
ticularly an oil filter for hydraulic installa-
tions, having an annular filter element ac-
commodated within a cup-shaped housing
having an annular cover sealed thereto, the
central opening in the cover being for out-
let of the filtrate and other openings in the
cover being provided for inlet of the liquid
to be filtered into an annular space between
the filter element and the housing wall. A
non-return valve arrangement is provided
in association with the inlet openings, while
bypass openings with another non-return
valve arrangement, operating at a higher
liquid pressure than that associated with the
inlet openings, provide a bypass for the filter
element should the latter become choked.

According to the present invention there
is provided an oil filter for an hydraulic in-
stallation, including: a cup-shaped housing;
an annular filter element contained within
the housing; a cylindrical sleeve mounted
on the end of the filter element adjacent the
open end of the housing and projecting
axially towards the open end; an elastically
deformable annular valve member of V-
shaped cross-section whose shanks provide
a pair of annular lip seals, the interior sur-
face of the apex of the V seating on the pro-
jecting end of the cylindrical sleeve; and an
annular cover sealed to the open end of the
housing and having a central filtrate out-
let opening and a ring groove receiving the
apex of the V-section of the valve member;
wherein the cover is provided with openings
for the inlet of liquid to be filtered into an
annular space between the filter element and
the housing wall, the said sleeve is provided
with at least one bypass opening affording
communication between the inlet and outlet
openings of the filter for bypassing the filter

element; and wherein the apex of the V-
section of the valve member is clamped be-
tween the said cylindrical sleeve and the
ring groove, and the shanks of the valve
member are urged by their elastic stress to
press against the cover and the cylindrical
sleeve, respectively, to close the inlet and by-
pass openings, the closing pressure exerted
by the shank against the cylindrical sleeve
being greater than that exerted by the other
shank against the cover.

Fig. 1 is a cross-section through a filter in
accordance with the invention, in the in-
operative position with non-return and by-
pass valves closed;

Fig. 2 shows an upper portion of Fig. 1
during normal operation, thus with the non-
return valve open, and

Fig. 3 shows the upper portion of Fig. 1
during excess pressure operation, with the
non-return and bypass valves open.

The numeral 1 in the drawing denotes a
cup-shaped housing which is closed by an
annular cover 2 sealed thereto. Within the
housing an annular filter element 3 is ac-
commodated which is clamped between the
cover 2 and a base 4 with interposition of a
sealing ring 5 and an elastically deformable
annular valve member 6. The filter element
3 consists of an annular star 7 of filter paper,
which internally is supported by a sieve
sleeve 8 and is supported and sealed at both
end faces by supporting rings 9 and 24. The
inner edge of the support ring 9 is bent up
towards the cover 2 into an annular sleeve
10 which has a plurality of apertures formed
therein and spaced around its circumference
one of which, an aperture 11, is shown in
the drawing. The control aperture 12 of the
cover 2 provides an outlet opening for the
purified filtrate, from a filter chamber 13—
i.e. the interior space enclosed by the filter
element 3.

The cover 2 has a frustoconical portion
pierced by a ring of inlet openings, one of
which, an inlet opening 14, is shown in the
drawing. The inlet opening 14 leads into
an annular space 15 between a side wall 16
of the cup 1 and the filter element 3. The

valve member 6 has a V-shaped cross-section, its apex 17 fitting into a ring groove 18 formed by the junction of the frustoconical portion with an inwardly turned cylindrical skirt portion which surrounds the outlet opening 12 at the smaller diameter of the frustoconical portion and is coaxial therewith. The valve member, when the filter is assembled, is clamped in the ring groove 18 by the upper edge 19 of the sleeve 10, which projects into the inside of the apex 17. The outer shank 20 of the valve member 6 is under stress caused by the resilience of the ring, which may be made of rubber or rubber-like plastics material, and presses against the frustoconical portion of the cover 2 and covers the inlet opening 14. The inner shank 21 of valve member 6 similarly presses against the sleeve 10 and covers the aperture 11, the closing pressure exerted by the shank 21 being greater than that of the outer shank 20. The shank 20 is a sealing ring lip of a non-return valve, and the shank 21 a sealing lip of a bypass valve.

All parts of the filter shown are formed substantially cylindrically symmetrical relative to the axis of symmetry 23. The functions of the two valves are illustrated in Figs. 2 and 3, in which arrows are shown, which indicate the flow of a filterable medium. In the inoperative position the valve member 6, with its two shanks 20 and 21, as shown in Fig. 1, presses against the cover 2 and the sleeve 10, respectively, and closes both the opening 14 and the aperture 11.

During normal operation the operating pressure of the liquid being filtered overcomes the elastic stress of the outer shank 20 and depresses the latter, which operates as a non-return valve. The inner shank 21, which is stressed more strongly, is not deformed by the normal operating pressure, so that the overflow valve remains closed.

If a predetermined operating pressure is exceeded, then the inner shank 21 yields as shown in Fig. 3, and exposes the aperture 11 and other apertures of the sleeve 10, not shown in the drawing, so that the filterable liquid can now flow directly from the annular space 15 through the bypass apertures into the filter chamber 13, as shown by the arrow 22 in Fig. 3.

WHAT WE CLAIM IS:—

1. A filter, more especially an oil filter

for an hydraulic installation, including: a cup-shaped housing; an annular filter element contained within the housing; a cylindrical sleeve mounted on the end of the filter element adjacent the open end of the housing and projecting axially towards the open end; an elastically deformable annular valve member of V-shaped cross-section whose shanks provide a pair of annular lip seals, the interior surface of the apex of the V seating on the projecting end of the cylindrical sleeve; and an annular cover sealed to the open end of the housing and having a central filtrate outlet opening and a ring groove receiving the apex of the V-section of the valve member; wherein the cover is provided with openings for the inlet of liquid to be filtered into an annular space between the filter element and the housing wall, the said sleeve is provided with at least one bypass opening affording communication between the inlet and outlet openings of the filter for bypassing the filter element; and wherein the apex of the V-section of the valve member is clamped between the said cylindrical sleeve and the ring groove, and the shanks of the valve member are urged by their elastic stress to press against the cover and the cylindrical sleeve, respectively, to close the inlet and bypass openings, the closing pressure exerted by the shank against the cylindrical sleeve being greater than that exerted by the other shank against the cover.

2. A filter as claimed in claim 1 wherein the filter element is closed and sealed at its ends by respective end rings and the said cylindrical sleeve is formed as an integral projection from the inner edge of one of the end rings.

3. A filter as claimed in claim 1 or 2, wherein the said cover has a frustoconical portion terminating at its smaller diameter in an inwardly turned cylindrical skirt portion coaxial with the frustoconical portion, the said ring groove being provided by the junction between the two portions, the said inlet openings being in the frustoconical portion.

4. A filter substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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1390003 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of
the Original on a reduced scale*

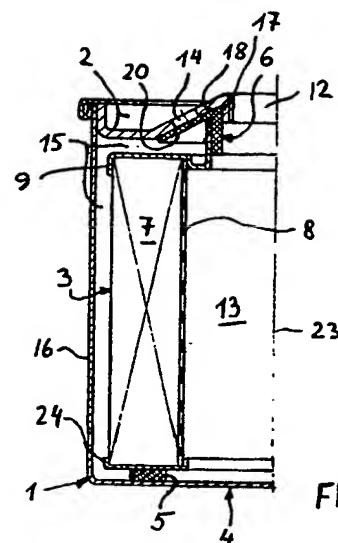


FIG.1

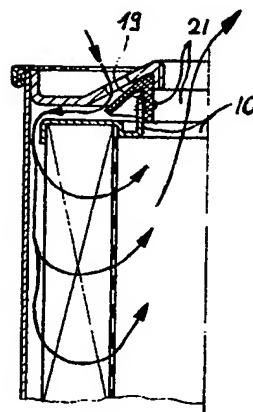


FIG.2

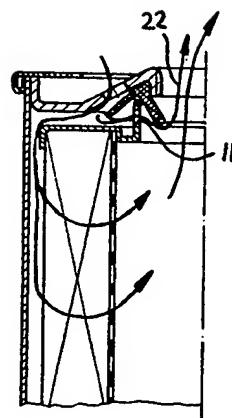


FIG.3

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